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An overview of the variational approach to mollification

Mollification is a natural way to the regularization of ill-posed linear equations, in particular for signal and image applications. A corner stone in the development of this idea is probably the well-known approximate inverses, introduced in 1990 by Louis and Maass. Let us also mention the contribution, in the specific field of deconvolution, of Lannes et al., who gave a variational formulation of a similar regularization principle. Until recently, this variational approach lacked generality and some mathematical foundation: generality since it was designed for deconvolution (or Fourier synthesis) only, and mathematical foundation since no result on the behavior of the solution when letting the natural regularization parameter go to zero had been obtained (or even questioned).

Our work over the past few years focused in part on these aspects. The purpose of this talk is twofold: on the one hand, we will give an overview of the aforementioned extension and theoretical foundation of the variational approach to mollification, and on the other hand, we shall describe some recent results on approximate intertwining relationships of operators, which are central to the implementation of the methodology in the general case.